Forensic Engineering Investigations of Two Accidents

California Boiler Inspectors Association

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Introduction

- Pacific Coast Process Solutions, Inc.
- Work Experience
  - Projects
  - Clients
  - Boiler & Machinery/Machinery Breakdown
  - Property claims – fires, water losses
  - Construction Defect Claims
  - Personal injury, wrongful death

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Two Accidents

- Large Explosion
  - Oilfield – 3,300 barrel crude tank
  - Fuel – gas entrained in crude
  - No injuries
- Small Explosion
  - So Cal Hotel – bar/fire feature
  - Fuel - LPG
  - Several injuries
- What do these 2 accidents have in common?

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WASH TANK
OIL-WATER


T230
OIL/WATER
330 BBLS
CAUTION


OILWATER
OIL/WATER

This originally started off as a Boiler & Machinery claim…..

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Cathodic Protection system – one potential ignition source

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Top of the tank

Equalization line sheared

Location of “sucker truck”

Measuring truck location

Approximate liquid level

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Evidence of explosion on valve

Evidence of explosion on valve

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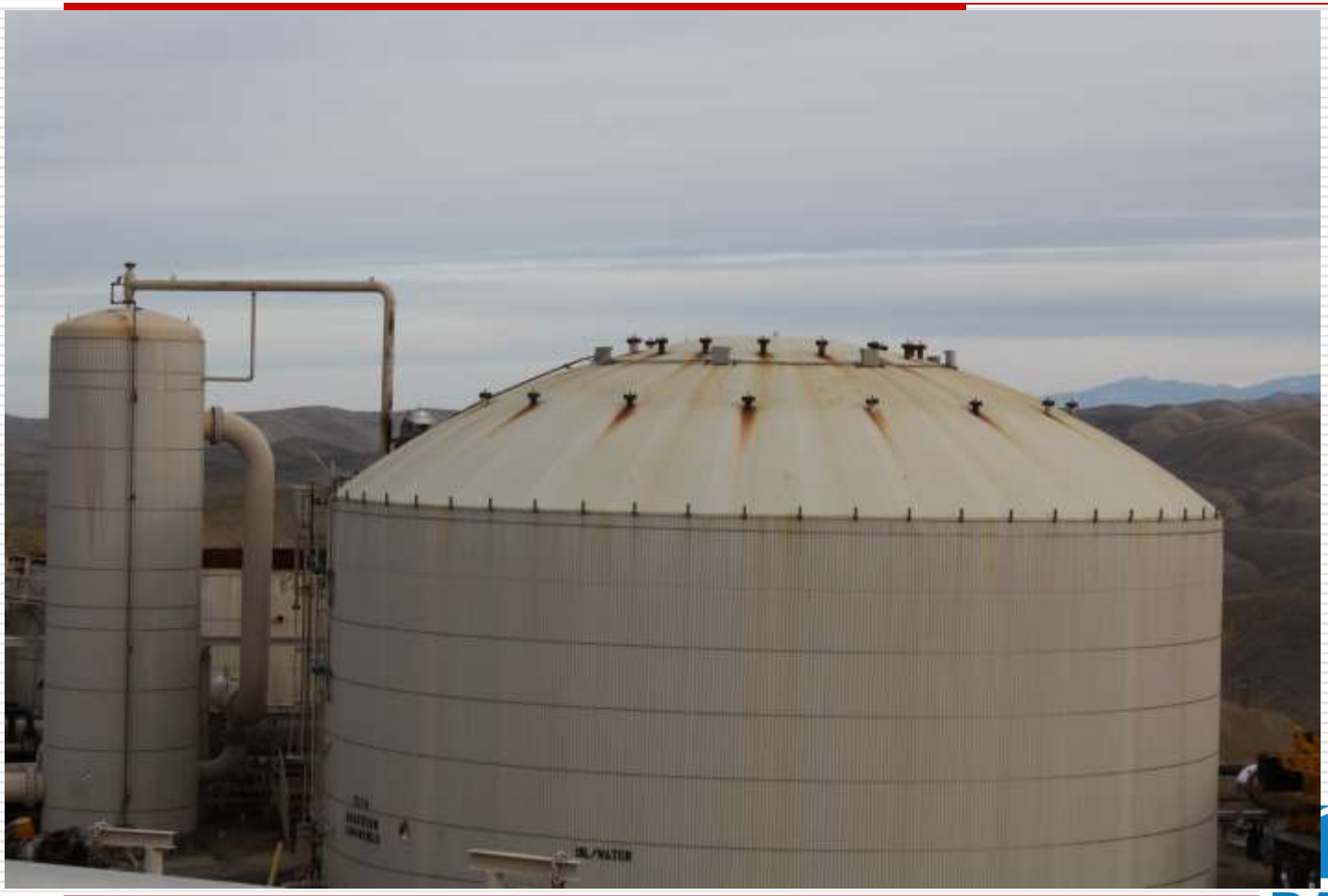
Steam heating panels in tank interior

Similar tank with cathodic protection



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Tank disassembly

Tank demo continued

Tank demo

Anode rod

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Sucker truck and tanks

Truck and tanks

NFPA 77 – Recommended practice for Static Electricity

Split in tank bottom

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Evidence inspection

Evidence inspection

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Evidence inspection

Evidence inspection

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Evidence inspection

Conclusion

- Case settled in the Fall of 2014
- No person or equipment was inside tank at time of explosion
- No evidence of arcing
- No evidence Cathodic Protection system caused or contributed to loss
- Evidence of explosion, epicenter consistent with location of tank top

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Conclusion cont'd

- Most likely cause of explosion was static electricity
- Several violations were found
- CCR Title 8, subchapter 4, article 36
- CCR Title 8, subchapter 7, article 147
- CFR 1910.106 ignition sources, static electricity protection pages 232, 240, 241, 242, 251, and 252
- Several references in State of CA and Federal codes to NFPA 77

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LPG Explosion

- Hotel in Orange County
- Fire feature fueled by LPG
- One woman – burned and required hospitalization and several surgeries
- Other women nearby – minor burns

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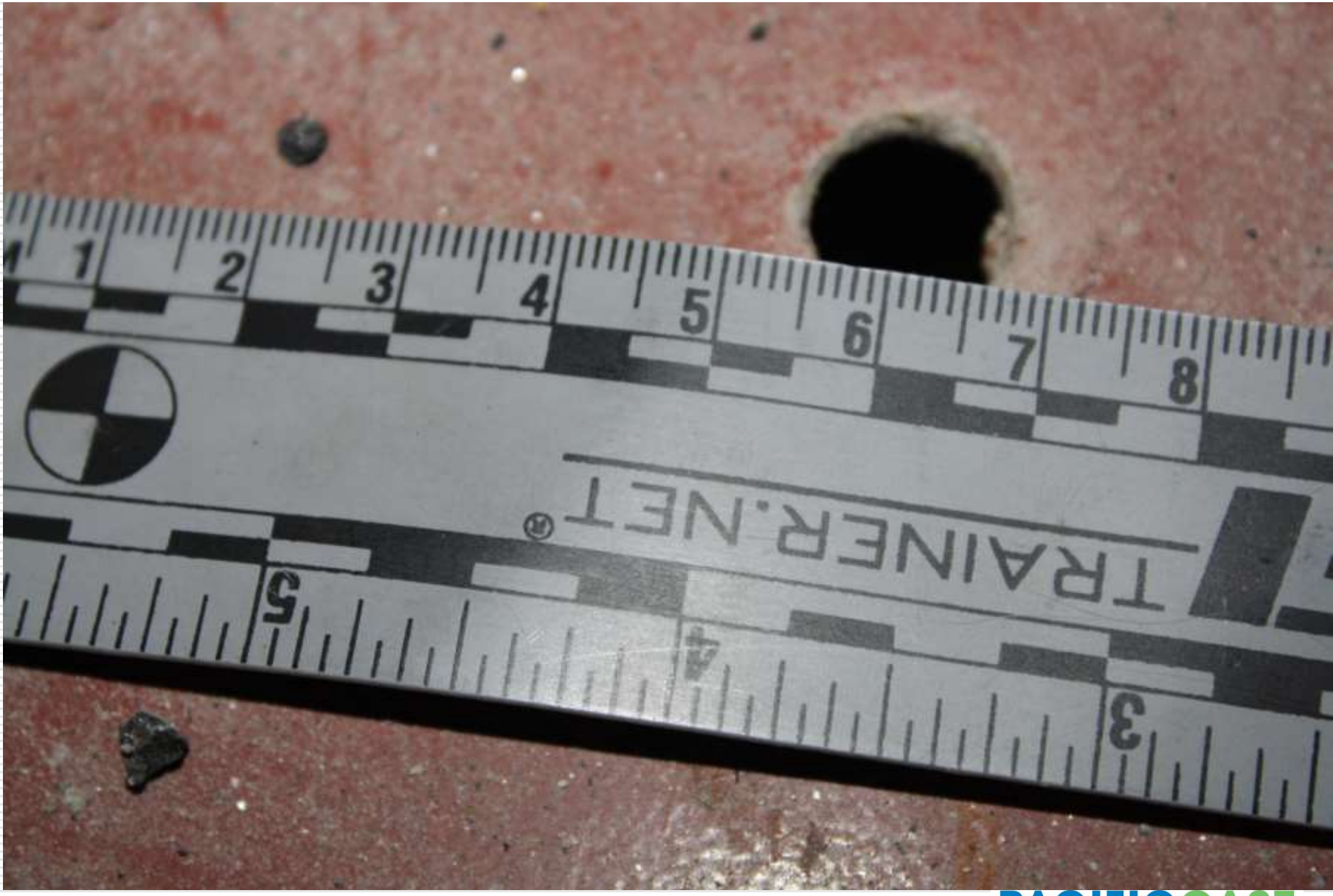

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Conclusions

- Case settled in December 2013
- Leak checks were performed on the entire gas train.
- The only leak found was the valve on the LPG cylinder.
- The exemplar regulator leaked more than the subject regulator.
- Other design issues contributed to this explosion – venting in the cylindrical vessel.

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